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Identifiers-*Ohio Trade and Industrial Education Achievement Test

The Ohio Trade and Industrial Education Achievement Test battery is comprised of seven basic achievement tests: Machine Trades, Automotive Mechanics, Basic Electricity, Basic Electronics, Mechanical Drafting, Printing, and Sheet Metal. The tests were developed by subject matter committees and specialists in testing and research. The Ohio Trade and Industrial Education Services, Instructional Materials Laboratory, publishes and distributes the tests and provides the services of scoring, reporting, and evaluating test results. The tests have been continuously revised since 1958 through study of item analyses; content, construct, and predictive validities; reliability coefficients; and standard error of measurements. The trade tests, the Stanford Arithmetic Achievement Test, and the California Survey of Mental Maturity have been normed of the same population to allow generalizations about an individual's intelligence and achievement scores. The multiple-choice questions require the student to solve problems, analyze data, recall specific facts, react to generalizations, use abstractions, and put together parts to form a whole. Administration time for the various tests varies from 4 1/2 to 7 1/2 hours. The test results aid in curriculum reorganization and improvement of instruction, as well as provide information on student achievement. The appendixes provide test profile norms and a list of schools participating in the testing program. (HC)

DIVISION OF VOCATIONAL EDUCATION, STATE DEPARTMENT OF EDUCATION, COLUMBUS, OHIO

TRADE AND INDUSTRIAL EDUCATION

ACHIEVEMENT TEST PROGRAM

OFFERED BY

OHIO TRADE AND INDUSTRIAL EDUCATION SERVICES

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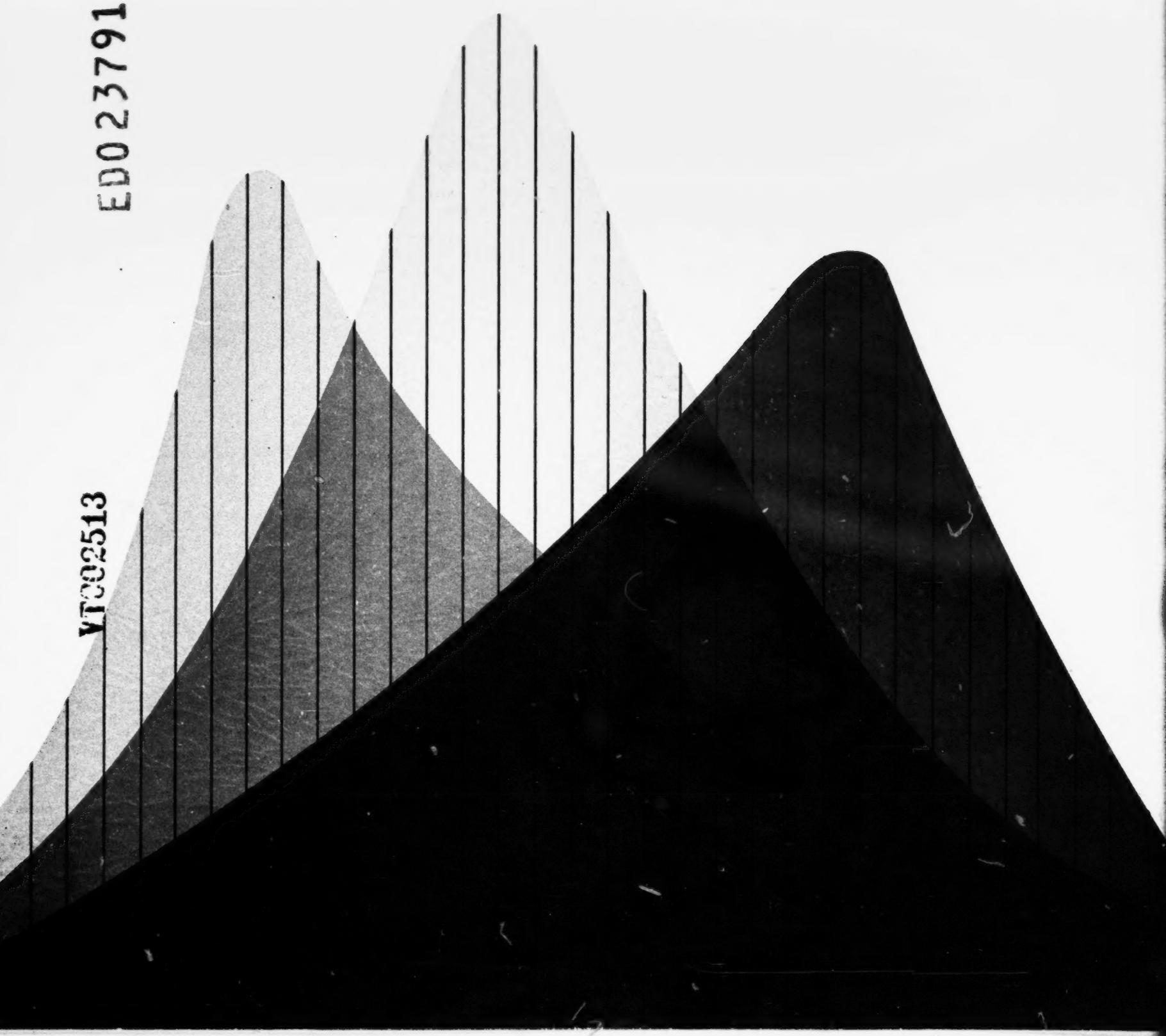

ACHIEVEMENT TEST PROGRAM

State Department of Education
Division of Vocational Education

MARTIN ESSEX
Superintendent of Public Instruction

BYRL R. SHOEMAKER
Director Vocational Education

OHIO TRADE AND INDUSTRIAL EDUCATION SERVICE

HARRY J. DAVIS
Supervisor Trade and Industrial Education

PUBLISHED BY

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The Ohio State University
980 Kinnear Road
Columbus, Ohio 43212

FROM: (Person) W. F. Stover (Agency) Instructional Materials Laboratory

(Address) 1885 Neil Avenue, Columbus, Ohio 43210

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Users of Material Student tested with supervisors & instructors using the result

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CONTENTS

I. NATURE AND PURPOSE OF THE TESTS 1

Organization of the Tests
Sample Test Items
What the Test Battery Measures
Uses of the Test

II. TECHNICAL INFORMATION 9

Test Development
Validity
Reliability
Standard Error of Measurement
Research

III. TEST ADMINISTRATION 15

APPENDIX 17

Appendix A - Test Profile Norms
Appendix B - Schools Participating

THE NATURE AND PURPOSE OF THE

OHIO TRADE AND INDUSTRIAL EDUCATION TESTS

The Ohio Trade and Industrial Education Achievement Test battery grew out of demands by Ohio educators for instruments which measured success in trade areas. The tests are specially designed instruments for evaluation and diagnosis of vocational achievement.

These tests were originated in 1958, at the Ohio Trade and Industrial Education Local Supervisors' Workshop. Prior to 1963, the distribution of tests was limited to Ohio. However, the states of Illinois, Indiana, Kentucky, West Virginia, Delaware, Utah and the District of Columbia have participated in this program.

ORGANIZATION OF THE TESTS

The battery is comprised of seven basic achievement tests: Machine Trades, Automotive Mechanics, Basic Electricity, Basic Electronics, Mechanical Drafting, Printing and Sheet Metal.

Machine Trades

Part I consists of eight sections designed to measure the student's ability to handle: (1) Applied Machine Trade Mathematics (2) Layout (3) Hand Tools (4) Measuring (5) Power Sawing (6) Drilling (7) Shaping and (8) Heat Treating Part I contains 99 items.

Machine Trades Part II is made up of nine sections which are: (1) Machine Trade Science (2) Machining-Lathe (3) Milling (4) Blueprint Reading (5) Grinding-Bench (6) Grinding-Surface (7) Grinding-Tool and Cutter (8) Grinding-Cylindrical and (9) Grinding-Internal. There are 172 items in this section.

Automotive Mechanics

Part I contains five sections and 150 items in the following areas: (1) Engine (2) Fuel System (3) Suspension System (4) Brake and (5) Basic Equipment and Tools.

Part II has six sections and 156 items designed to measure: (1) Automotive Science (2) Cooling System (3) Electrical System (4) Power Train (5) Steering System and (6) General Service.

Basic Electricity

The Basic Electricity test is developed around nine areas and has 240 items concerned with: (1) Direct Current Electricity (2) Laws of Magnetism (3) Alternating Current Electricity (4) Measurement (5) Construction Wiring (6) Diagnosis and Maintenance (7) Circuit Tracing (8) Applied Mathematics and (9) Applied Science.

Basic Electronics

The Basic Electronics test contains 100 items and eight sections including: (1) Tuning Circuits (2) Vacuum Tubes (3) Semiconductor Characteristics (4) Power Supplies (5) Amplifiers (6) Detector Circuits (7) Test Equipment and (8) Oscillator Circuits.

Mechanical Drafting

Part I has ten sections and 151 items in the following areas: (1) Drafting Materials and Equipment (2) Dimensioning (3) Auxiliary Views (4) Threads and Fasteners (5) Production or Working Drawing (6) Machine Elements (7) Auxiliary Information (8) Industrial Processes (9) Materials of Industry and (10) Applied Science.

Part II incorporates 99 items in the following eight areas: (1) Orthographic Projection (2) Sectional Views (3) Pictorial Drawing (4) Intersections and Developments (5) Geometric Drawing (6) Lettering (7) Reproduction of Drawings and (8) Functions of Mathematics.

Printing

Part I contains ten sections and 197 items: (1) Orientation (2) Printing Planning (3) Hand Composition (4) Machine Composition (5) Photo Composition (6) Camera Operation (7) Film Processing (8) Letterpress Platemaking (9) Letterpress Presswork and (10) Applied Science.

Part II has six sections and 143 items concerned with: (1) Lithographic Stripping and Platemaking (2) Lithographic Presswork (3) Binding Work (4) Paper Technology (5) Ink Technology and (6) Applied Mathematics.

Sheet Metal

Part I has 144 items covering seven sections: (1) Blueprint Reading (2) Applied Science (3) Applied Mathematics (4) Hand Tool Operations (5) Machine Operations (6) Soldering and (7) Special Operations.

Part II has 100 items and seven sections: (1) Mechanical Drawing (2) Freehand Sketching (3) Metals (4) Non-Metallic (5) Layout Operations (6) Fabricating Operations and (7) Welding.

SAMPLE TEST ITEMS

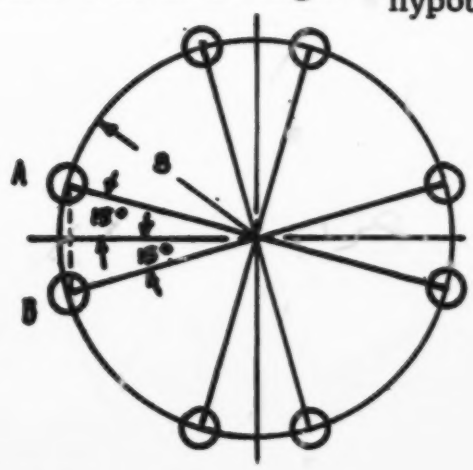
All questions are multiple choice, with four possible responses; one is correct and the other three are distracters. Examples from the various tests follow:

Machine Trades - Sample Questions

A. The center to center distance on a straight line between A and B is - (Note: the sine of 15^{o}=.2588) (Formula: Sine of an angle=$\frac{\text{side opposite}}{\text{hypotenuse}}$

(1) 4.4211 (2) 4.2411

(3) 4.4141 (4) 4.1408

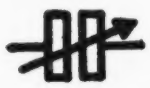


B. Coolants are used on the milling machine to-

1. cool the work, clear chips and lubricate the tool.
2. dispose of chips and lubricate the machine.
3. clean the work, lubricate the machine, and cool the chip.
4. permit greater clearance on the cutter.

Automotive Mechanics - Sample Questions

A. Which symbol is used to indicate a resistor in an electrical circuit?

1.
2.
3. 
4.

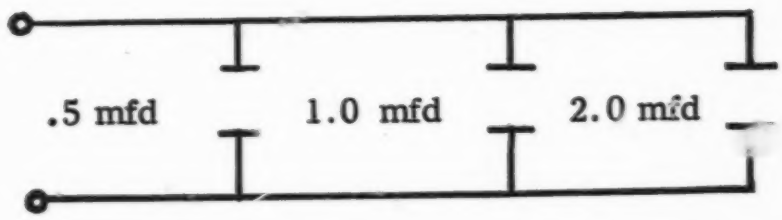
B. A low reading on a compression test of two adjacent cylinders indicates -

1. blown head gasket.
2. bad valves.
3. burning oil.
4. valves sticking.

Basic Electricity - Sample Questions

A. In the circuit illustrated the total capacitance is -

1. 3.5
2. 1.0
3. 0.5
4. 2.0

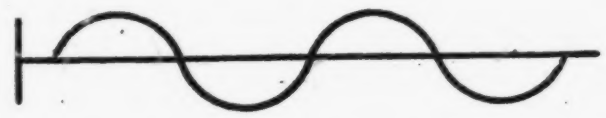
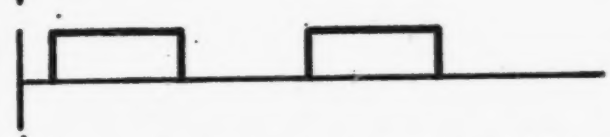


B. If an Ohmmeter reads 1000 ohms. and a voltmeter reads 270 volts, there is a current of -

1. .27 amps.
2. 3.7 amps.
3. 370 amps.
4. 2700 amps.

Basic Electronics - Sample Questions

A. A standard pattern found on half wave rectifiers is shown by -

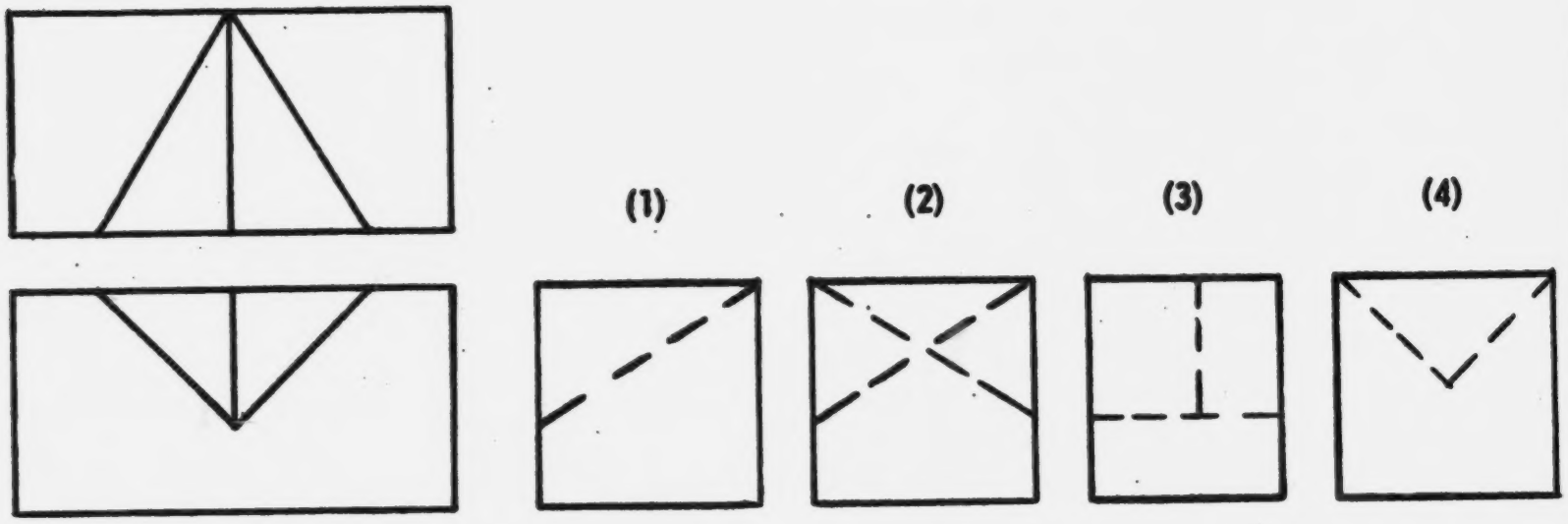
1.
2. 
3.
4. 

B. The purpose of chokes and capacitors in a power supply is to -

1. smooth out pulsating D.C. current.
2. step up the voltage.
3. provide various potentials.
4. rectify the voltage.

Mechanical Drafting - Sample Questions

A. Choose the correct side view.



B. The reason for an auxiliary view is to show -
   1. the slanted surface in its true shape and size.
   2. the correct contour of the object.
   3. the exact interior of the object.
   4. all the parts in true relationship to each other.

Printing - Sample Questions

A. Most inks dry by a combination of -
   1. oxidation and absorption.
   2. absorption and emulsification.
   3. oxidation and homogenization.
   4. absorption and adsorption.

B. When locking up a form for an automatic cylinder press, the stone man must allow sufficient margin for -
   1. gripper bite on gripper edge.
   2. half inch trim on all sides.
   3. two inch gripper bite on three sides.
   4. one-sixteenth inch gripper bite.

Sheet Metal - Sample Questions

A. The shears that are specially designed for cutting assembled pipe of various sizes are called-
   1. double cutting shears.
   2. hawkbill snips.
   3. bench shears.
   4. compound lever shears.

B. Because copper has a high rate of expansion, we must, when doing "flashing" work, be careful to avoid-
   1. especially long sections.
   2. using elastic caulking compound.
   3. using 50-50 solder.
   4. using galvanized alongside.

WHAT THE TRADE AND INDUSTRIAL EDUCATION

TEST BATTERY MEASURES

These tests were developed to measure skills and understanding in specific vocational areas. Students are requested to: (1) solve problems (2) analyze data (3) recall specific facts (4) have a knowledge of principles (5) react to generalizations (6) be able to use abstractions in specific situations and (7) put together parts so as to form a complete structure.

USES OF THE TEST

Test results should be evaluated in terms of the school's overall objectives and philosophy. A student's test performance begins with the subject area scores and proceeds through the subdivisions of the test. The greatest value of skills testing is found when subscores and item responses are utilized in evaluation and diagnosis.

The Stanford Arithmetic Achievement test, the Ohio T and I Achievement tests and the California Survey of Mental Maturity tests have been normed on the same population; therefore, generalizations can be made about an individual's intelligence and achievement scores. It may be anticipated that an individual's mental age should correspond to his achievement score. The use of the mental ability test result will give the teacher an indication as to how the student is using his mental capacity in a particular vocational area.

Improvement of Instruction

The test results can be utilized to identify strong and weak areas of instruction, and may indicate a need for some curriculum reorganization.

The lack of equipment, or poor quality of equipment may be identified as a cause for student ineffectiveness.

The trade achievement scores can aid an instructor in the evaluation of the students' performance in relation to the students' intelligence.

The testing program may motivate instructors and students toward higher achievement, and will assist the learning process.

School and Community Research

Relationships of mental maturity, arithmetic and vocational achievement may support present student selection procedures or indicate a need for changes in selection techniques.

California Survey of Mental Maturity and Stanford Arithmetic achievement scores can be compared with national profiles in group analysis studies.

Student Benefits

The test results will provide information for teachers and counselors for job placement.

The teacher and student will have evaluative information concerning his (the student's) ranking in local and state settings.

Local, state and national awards could be presented on the basis of the test scores.

TECHNICAL INFORMATION

TEST DEVELOPMENT

Local supervisors of Trade and Industrial Education determine the trade in which a test is to be developed. A committee is then organized to develope a course outline. The committee is comprised of a representative of the state supervisory staff, a teacher-educator, a local supervisor of Trade and Industrial Education, selected teachers of the course, and a representative of the Ohio Trade and Industrial Education Services, Instructional Materials Laboratory. (1) The course outline is comprehensive in listing units of instruction which the committee determines should be offered in the course. (2) The committee developes and reviews questions based on the course outline. (3) The Ohio Trade and Industrial Education Services, Instructional Materials Laboratory compiles, publishes, and distributes the test. They also provide the scoring, the reporting, and the evaluation of test results.

After the first year of use, a test is revised by the committee using item analysis. Each question is reviewed on the basis of types of responses made by students. If the analysis indicates a question is faulty, the item is either replaced or rewritten.

VALIDITY

The items selected for use in the Ohio T and I Achievement tests have been selected from a general pool of items. Item analysis data, which yield discrimination values and difficulty level, have been produced for each item. Based on this information, final forms of each test have been developed. These items are constantly under surveillance and new analyses are run each year.

Test validity studies have been developed in various ways: first, content validity of items was established by test developers, then construct validity was determined by test battery intercorrelation. Predictive validity was established by correlating test scores and teachers' grades. Results of these studies are reported in Tables I and II. Continuing research is being done for these tests and new instruments as they are developed. A study of teacher characteristics and student success is briefly discussed on page 14 of this manual.

TABLE I

TRADE AND INDUSTRIAL TEST VALIDITY
1961 - MACHINE TRADES SENIORS

Correlations (N=458)	California Survey of Mental Maturity Non-Lang.	Lang.	Stanford Arithmetic	T and I Achievement	Course Shop Grade
California Survey of Mental Maturity Non-Language		.58	.43	.34	.29
Language			.57	.46	.27
Stanford Arithmetic				.50	.29
T and I Achievement					.35
Means	22.76	21.72	33.35	159.32	2.41
Standard Deviation	5.68	6.14	6.25	31.05	.82

TABLE II

TRADE AND INDUSTRIAL TEST VALIDITY
1961 - AUTOMOTIVE MECHANICS SENIORS

Correlations (N=314)	California Survey of Mental Maturity Non-Lang.	Lang.	Stanford Arithmetic	T and I Achievement	Course Shop Grade
California Survey of Mental Maturity Non-Language		.45	.38	.39	.20
Language			.53	.42	.08
Stanford Arithmetic				.36	.13
T and I Achievement					.39
Means	21.89	20.61	29.49	178.00	2.40
Standard Deviation	5.59	6.36	7.72	37.74	.84

RELIABILITY

The Spearman - Brown formula ($r_{tt}=\frac{2r_{oe}}{1+r_{oe}}$) was used to determine test reliability. [1] The student sample consisted of Ohio high school juniors and seniors who were involved in the T and I test validation studies. Test reliability scores give some indication of the confidence which a test user may place in a given test; however, the standard error of measurement is usually more useable in indicating how adequately an obtained score represents a true score. Table III presents T and I reliability coefficients, means and standard deviations for Ohio juniors and seniors.

(1) Downie, N.M. and R.W. Heath, Basic Statistical Methods, Harper and Brothers, 1959.

TABLE III

MEANS, STANDARD DEVIATIONS, AND RELIABILITY COEFFICIENTS

Trade and Grade	N	Means	Standard Deviations	Reliability Coeff.
MACHINE TRADES				
Juniors	583	136.47	27.48	.94
Seniors	483	162.27	32.42	.95
AUTOMOTIVE MECHANICS				
Juniors	428	157.92	35.50	.95
Seniors	384	185.34	38.53	.96
BASIC ELECTRICITY				
Juniors	279	105.63	30.50	.95
Seniors	244	116.00	32.03	.95
BASIC ELECTRONICS				
Juniors	206	39.83	10.87	.82
Seniors	263	50.95	14.54	.90
MECHANICAL DRAFTING				
Juniors	177	119.98	25.04	.93
Seniors	149	143.19	27.18	.92
PRINTING				
Juniors	112	149.85	36.14	.96
Seniors	110	168.98	47.41	.97

Based on Ohio students tested in 1964.

THE STANDARD ERROR OF MEASUREMENT

The standard error of measurement helps a test interpreter determine the size of a discrepancy in a test score of an individual. The formula:(2)

$$r_t \infty = \sigma_t\sqrt{1 - r_{tt}}$$

is used to find the standard error of measurement for the Ohio T and I tests.

An estimate of the dispersion of a group of obtained scores from corresponding true scores are reported as the S. $E._m$ for T and I tests on the following table.

TABLE IV

OHIO TRADE AND INDUSTRIAL ACHIEVEMENT TEST
STANDARD ERROR OF MEASUREMENT

TRADE	N	STANDARD ERROR OF MEASUREMENT (S. $E._m$)
Machine Trades	483	7.25
Automotive Mechanics	384	7.71
Basic Electricity	244	7.16
Basic Electronics	263	4.60
Mechanical Drafting	149	7.69
Printing	110	8.71

Based on Ohio students tested in 1964.

(2) Guilford, J.P., Fundamental Statistics in Psychology and Education, McGraw-Hill Book Company, 1956

RECENT RESEARCH

A study was conducted to evaluate teaching and learning in Ohio T and I programs. The specific areas of inquiry dealt with (1) the teacher, his background and preparation (2) the relationship between amount of money spent per student and quality programs (3) the local supervisor's rating as a descriptive evaluation of quality programs (4) the self concept characteristics of T and I teachers (5) the differences that exist between specific areas of many T and I programs and (6) the factors that appear to be significant in quality programs.

Students involved in this study were juniors and seniors in selected Ohio schools. The number who satisfied the established criteria was over 5000. This sample was involved in the teacher characteristic and the financial study. Approximately 2200 students were involved in quality program evaluation. All students were from schools with approved Ohio Trade and Industrial programs. The (325-350) teachers in this study were involved in the instructional process of the above mentioned students.

Local supervisors of approved Ohio T and I programs received the instruments used in this evaluation. The instruments were: (1) Expenditure Analysis (2) Teacher Rating Sheet (3) Teacher Background and Preparation and (4) The Opinion, Attitude and Interest Survey.

Significance of difference tests were performed between groups. T and I areas were ranked 1 - 16 on all scales in this analysis, and were compared descriptively by this ranking throughout the report.

The criterion regarding student success in the study was the Ohio T and I achievement tests. More information concerning this research, the findings and implications for continued study of students, teacher behavior, facilities and other factors may be obtained by contacting the Instructional Materials Laboratory, The Ohio State University, Columbus.

TEST ADMINISTRATION

The Ohio Trade and Industrial Education Achievement Tests are given near the end of each school year. The trade test, the California Survey of Mental Maturity and the computation section of the Stanford Arithmetic Test are to be taken by each student. These tests prove to be quite valuable in identifying students' mental maturity and arithmetic grade placement.

First Day of Testing (Allow 1-1/2 hours)

The Survey of Mental Maturity and the Stanford Arithmetic are to be given the same day. The Survey of Mental Maturity is a timed test and requires 30 minutes. The two sections of this test, Non-Language and Language, require 15 minutes each. A mark-sense answer card is used for the Survey of Mental Maturity examination.

The Stanford Arithmetic Test is a timed test and will require 35 minutes. Only the computational section of the test will be used.

Second Day of Testing (Allow 1-1/2 to 3 hours, depending upon tests being taken)

The Ohio Trade and Industrial Education Achievement Tests are power tests, and students should be allowed to complete all items. The following list of tests and their approximate times should be studied prior to scheduling. All students will take both parts of a test. NOTE: Basic Electricity and Basic Electronics are separate tests and are NOT divided into PARTS.

Machine Trades Achievement Test, Part I	3 hours
Automotive Mechanics Achievement Test, Part I	1-1/2 hrs.
Basic Electricity Achievement Test	3 hours
Mechanical Drafting Achievement Test, Part I	3 hours
Printing Achievement Test, Part I	2-1/2 hrs.
Sheet Metal Achievement Test, Part I	3 hours

Third Day of Testing (Allow 1-1/2 to 3 hours, depending upon tests being taken)

The Ohio Trade and Industrial Education Achievement Tests are power tests and students need sufficient time to complete all items. The following lists of tests and their approximate times should be studied prior to scheduling. All students who have taken Part I of an achievement test should be scheduled for Part II.

Machine Trades Achievement Test, Part II	3 hours
Automotive Mechanics Achievement Test, Part II	1-1/2 hrs.
Basic Electronics Achievement Test	1-1/2 hrs.
Mechanical Drafting Achievement Test, Part II	3 hours
Printing Achievement Test, Part II	1-1/2 hrs.
Sheet Metal Achievement Test, Part II	3 hours

Administrators of the Test

Test materials are handled entirely by the test administrator. Instructors are not to review or have access to the tests. This is a precaution to protect the validity of the tests, since a purpose of the tests is to improve instruction. Instructors are aware that the value and purpose of the test is lost if they have reviewed the questions and have prepared the students for specific questions or sections of the test.

All test books, answer cards, and other test materials are to be returned on the last day the tests are given.

APPENDIX A

TEST PROFILE NORMS

The following percentile profile sheets for the trades were developed from Ohio seniors tested in 1964. The California Survey of Mental Maturity and the Stanford Arithmetic Achievement Test scores are located on the top lines of each sheet. These norms are made from the actual sample tested. The intended use of the sheets is illustrated in the Hypothetical Case which permits the student to identify his achievement within the state norms and the school median.

a. Machine Trades

b. Automotive Mechanics

c. Basic Electricity

d. Basic Electronics

e. Mechanical Drafting

f. Printing

g. Sheet Metal

h. Hypothetical Case

Percentile Norm Sheets:

Listed to the left side of each percentile norm sheet are the tests and their sub-tests. The top three lines refer to the California Survey of Mental Maturity and its two sections (Non-language and Language). The fourth line is the Stanford Arithmetic total test score for the computational section. This is then followed by the total score for the trade test. The various sections of this test complete the listing.

The numbers in alignment with the test or its sections are raw scores. These scores are in a percentile distribution, reading from the 1st percentile to the 99th percentile. (See numbers immediately below "Percentile Norms.") The 50th percentile represents the median for the state.

OHIO MACHINE TRADES ACHIEVEMENT TEST

OHIO SENIORS 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median | Student Score

PERCENTILE NORMS

ITEM	1	2	3	4	5	10	20	30	40	50	60	70	80	90	95	96	97	98	99
SMM-A, F-1 Non-Lang.	11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	38
Language	6	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	39
TOTAL	21	26	28	30	31	32	33	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	76
Stanford Arith. Form Jm	11	17	18	19	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
OMTAT Total	52	85	98	102	105	108	109	113	115	121	123	124	126	128	130	131	133	134	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	152	153	154	155	156	157	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	179	180	182	183	184	185	186	187	188	191	193	195	197	198	199	202	204	206	209	211	213	214	217	220	222	223	231	245
Applied Math.	4	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Layout	0	1	2	3	4	5	6
Hand Tools	0	6	7	8	9	10	11	12	13
Measuring	0	1	2	3	4	5	6	7	8
Power Sawing	0	1	2	3	4	5	6
Drilling	0	1	2	3	4	5	6	7	8	9	10
Shaping	0	2	3	4	5	6	7	8	9	10	11	12	13
Heat Treating	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Trade Science	1	5	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Machining-Lathe	10	12	14	17	18	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	46	52
Milling	1	4	6	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Blue Print Reading	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Grinding: Bench	0	1	2	3	4	5	6	7	8
Grinding: Surface	0	1	2	3	4	5	6	7	8
Grinding: T & C	0	1	2	3	4	5	6	7	8	9	10	11	12	14
Grinding: Cyl.	0	1	2	3	4	5	6
Grinding: Internal	0	1	2	3	4	5	6

OHIO AUTOMOTIVE MECHANICS ACHIEVEMENT TEST

OHIO SENIORS 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median | Student Score

PERCENTILE NORMS

ITEM	1	2	3	4	5	10	20	30	40	50	60	70	80	90	95	96	97	98	99
SMM-A, F-1 Non-Lang.	6	11	12	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
SMM-A, F-1 Language	4	9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	38
SMM-A, F-1 TOTAL	20	25	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	63	64	65	69	75
Stanford Arith. Form Jm	0	11	13	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	44
OAMAT Total	50	88	103	111	115	117	121	123	125	127	132	136	138	140	142	146	149	150	151	153	154	155	156	157	158	159	161	163	164	167	168	170	171	172	173	174	177	178	180	181	182	183	185	187	188	189	190	191	193	194	195	197	198	199	202	203	204	205	206	208	210	212	213	214	215	217	218	220	221	224	225	227	228	229	230	233	235	236	241	242	244	247	250	255	263	282
Engine	11	24	28	30	32	34	35	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	73
Fuel System	3	4	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Suspension System	0	2	3	4	5	6	7	8	9	10	11	12	13	14	16
Brake System	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Basic Equip. and Tools	0	1	3	4	5	6	7	8	9	10	11	12	13	14	15
Automotive Science	1	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
Cooling System	1	2	3	4	5	6	7	8	9	10	11	12	13
Electrical System	7	9	11	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	47
Power Train	0	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26
Steering System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
General Service	0	2	3	4	5	6	7	8	9	10	11	12	13	14

OHIO

SENIORS

1964

OHIO BASIC ELECTRICITY ACHIEVEMENT TEST
OHIO BASIC ELECTRONICS ACHIEVEMENT TEST

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median			PERCENTILE NORMS 1 2 3 4 5 10 20 30 40 50 60 70 80 90 95 96 97 98 99	Student Score
	SMM-A, F-1	Non-Lang.	9 13 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37	
		Language	11 13 15 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	
		TOTAL	26 29 30 32 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 72 74	
	Stanford Arith. Form Jm		0 13 17 19 21 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	
	ELECTRICITY TOTAL		60 65 66 68 69 71 72 74 76 77 78 79 82 83 85 87 89 90 91 92 93 94 95 96 97 99 101 103 104 105 106 107 109 110 111 112 114 115 116 117 118 120 121 122 123 124 125 127 128 129 133 134 135 136 139 141 144 148 149 150 152 153 156 157 160 162 163 168 169 172 175 178 186 192 194 197	
	D.C. Current		6 9 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 35	
	Laws of Magnetism		4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 22 23 24 25 27 28	
	A.C. Electricity		10 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 48 50 54	
	Measurement		2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	
	Const. Wiring		0 1 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	
	Diag. & Maint.		0 2 3 4 5 6 7 8 9	
	Cir. Tracing		2 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	
	Applied Math		0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	
	Applied Science		0 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
	ELECTRONICS TOTAL			
	Tuning Cir.			
	Vacuum Tubes			
	Semi-Cond. Characteristics			
	Power Supplies			
	Amplifiers			
	Det. Circuits			
	Test Equip.			
	Oscillator Cir.			

OHIO BASIC ELECTRICITY ACHIEVEMENT TEST
OHIO BASIC ELECTRONICS ACHIEVEMENT TEST

OHIO

SENIORS 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median			PERCENTILE NORMS	Student Score
		TOTAL	1 2 3 4 5 10 20 30 40 50 60 70 80 90 95 96 97 98 99	
	SMM-A, F-1	Non-Lang.	9 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37	
		Language	6 9 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38	
		TOTAL	22 26 27 30 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 72 74	
	Stanford Arith. Form Jm		0 19 21 22 23 24 26 27 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	
	ELECTRICITY TOTAL			
	D.C. Current			
	Laws of Magnetism			
	A.C. Electricity			
	Measurement			
	Const. Wiring			
	Diag. & Maint.			
	Cir. Tracing			
	Applied Math			
	Applied Science			
	ELECTRONICS TOTAL		22 23 24 26 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 79 81 85 87	
	Tuning Cir.		0 1 2 3 4 5 6 7 8 9 10	
	Vacuum Tubes		0 1 2 3 4 5 6 7 8 9 10 11 12	
	Semi-Cond. Characteristics		0 1 2 3 4 5 6 7 8 9	
	Power Supplies		0 1 2 3 4 5 6 7 8 9 10	
	Amplifiers		0 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	
	Det. Circuits		0 1 2 3 4 5 6 7 8 9 10 11	
	Test Equip.		2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
	Oscillator Cir.		0 1 2 3 4 5 6 7 8 9 10	

OHIO MECHANICAL DRAFTING ACHIEVEMENT TEST

OHIO SENIORS 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median | Student Score

PERCENTILE NORMS

ITEM	1	2	3	4	5	10	20	30	40	50	60	70	80	90	95	96	97	98	99
SMM-A, F-1 Non-Lang.	11 14	16		17	18 19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
SMM-A, F-1 Language	8 11	12		13	14 15	16 17	18	19 20	21	22 23	24	25	26	27	28	29	30	31	32	33 34	35	36 37		
SMM-A, F-1 TOTAL	24 30		31		33 35	36 37 38	40 41	43	45 44	46 47	48	49	50	51	52	53	54 55	56	57 58 59	60 61	62	63	64	65 66	67	70 72
Stanford Arith. Form Jm	17 22			27	29 28	30 31	32	33	34	35	36	37	38	39	40		41		42		43		44		
OMDAT Total	68 85	90	92	93	97 98 102	103 104 106	107 109 112	115 116 118	120 123 126	127 129 130	131 133 134	135 136 137	138 139 141	142 144	146 147 148	149 151 152	153 154 155	157 158 159	160 161 162	163 164 166	167 169 170	172 173 174	176 179 186	187 197 199	205 206 224	
Materials & Equipment	2			3	4		5			6		7		8		9		10 11							
Dimensioning	2 3			4	5		6	7		8	9		10		11		12	13		14 16		17	18	20 21	
Auxiliary Views	1	2			3		4		5		6		7		8		9								
Threads & Fasteners	2		3		4 5		6		7		8		9		10		11		12		13 15				
Production or Working Dwgs.	4	5		6	7		8		9	10		11		12		13		14		15	16 18				
Machine Elements	1				2		3		4		5		6	7	8		9	10 11							
Auxiliary Information	4				5	6		7		8		9		10		11		12		13					
Industrial Processes	3			6 7	8	9		10		11		12		13	14		15	16	17	18		19 20			
Materials of Industry			1		2		3		4		5		6		7	8	9		10 12						
Applied Science	1 2		3		4	5		6		7		8		9		10		11		12	13	14 15	16 17		
Orthographic Projection	3		4	5	6	7		8		9		10		11		12		13		14		15			
Sectional Views	3 4		5		6	7	8		9	10		11		12	13		14		15		16		17 18	19	
Pictorial Drawings	1 2				3	4		5			6		7		8		9		10 11						
Intersections & Developments	1				2		3			4			5						6						
Geometric Drawing	0				1	2		3			4		5		6		7		8						
Lettering	0				1		2			3			4		5				6						
Reproduction of Drawings	0				1		2			3		4		5					6						
Functions of Mathematics	4	6		7 8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23 24	25					

OHIO PRINTING ACHIEVEMENT TEST

OHIO — SENIORS — 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median | Student Score

PERCENTILE NORMS

ITEM	1	2	3	4	5	10	20	30	40	50	60	70	80	90	95	96	97	98	99
SMM-A, F-1 Non-Lang.	10	13	14		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	37
SMM-A, F-1 Language	5	8	9		11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	37
SMM-A, F-1 TOTAL	18	22	26	28	29	30	31	33	34	35	36	37	38	39	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	63	64	67	71
Stanford Arith. Form Jm	13	14	15	16	17	19	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
OPAT Total	58	63	66	68	82	85	94	105	106	111	112	113	114	115	118	119	120	126	127	129	130	135	140	144	148	149	150	151	152	153	156	157	160	161	162	163	166	167	168	169	171	172	173	174	176	177	178	180	181	183	184	187	189	193	196	199	201	203	204	205	208	210	212	213	214	216	221	223	225	228	232	235	239	240	241	246	251	258	259	265	273
Orientation	1	2	3		4	5	6	7	8	9	10	11	12	13
Printing Planning	3	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26
Hand Composition	1	4	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Machine Composition	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Photo Composition	0	1	2	3	4	5	6	7	8	9	10	11
Camera Operation	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	19
Film Processing	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Letterpress Platemaking	0	1	2	3	4	5	6	7	8
Letterpress Presswork	0	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Applied Science	0	1	2	4	5	6	7	8	9	10	11	12	13	14	15	17
Lithograph, Stripping & Platemkg.	0	1	2	3	4	5	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	36
Lithographic Presswork	0	1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	28
Bindery Work	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Paper Technology	0	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ink Technology	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Applied Mathematics	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

OHIO SHEET METAL ACHIEVEMENT TEST

OHIO SENIORS 1964

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

School Median | Student Score

PERCENTILE NORMS

		1	2	3	4	5	10	20	30	40	50	60	70	80	90	95	96	97	98	99
SMM-A, F-1	Non-Lang.	8		10		12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		33
SMM-A, F-1	Language	4		10		11	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	31	32	35
SMM-A, F-1	TOTAL	16		22		24	25	28	29	30	34	36	38	40	41	42	43	45	46	47	48	50	51	52	53	54	56	57	58	59	60	61
Stanford Arith. Form Jm		16				18	20	22	24	26	27	28	29	30	31	32	33	34	35			36		37	38	39	40		41		42	43
OSMAT TOTAL			90		94	99	100	113	114		115	116	118	119	121	122	123	124	126	127	128	129	130	131	132	133	135	138	139	140	144	148	152		154
Blueprint Reading						4			5			6				7				8						9			10				11	12
Applied Science		4		5				6			7				8	9				10				11					12					13
Applied Mathematics				4		5		6		7		8		9		10	11			12		13		14		15		16	17					18
Hand Tool Operations		6				8		10		11		12			13		14			15			16			17				19			20
Machine Operations							8	9	10	11			12			13		14			15		16	17			18			19		20
Soldering		4		6		7	9	10		11						12			13				14			15		16			17	18
Special Operations		1					2			3				4							5						6		7			8
Mechanical Drawing			8			9		10			11		12		13					14			15					16	17			18
Freehand Sketching									1								2					3								4		5
Metals					4				5					6			7							8		9				10		11
Non-Metallic			1					2		3									4				5				6		7			8
Layout Operations						5					7			8			9		10		11		12				13	14				15
Fabricating Operations			1							2							3							4			5					6
Welding			3			4				5				6					7				8		9		10	11		12		15

REPORTING TEST RESULTS

A hypothetically plotted percentile norm chart showing how the charts can be effectively used is illustrated on the following page. Referring to the chart, it will be noted that the school's median scores are listed on the extreme left, giving the school median score for each test total, and for each section of each test. At the extreme right is listed a student's scores. By plotting the school median scores in red, and the student's scores in black (or another color), the profile shows how the school compares with the state as a whole, and how the student ranks both with his class and the state. A chart is provided for each student.

HYPOTHETICAL CASE — FOR PLOTTING BOTH SCHOOL AND STUDENT

OHIO SENIORS

OHIO MACHINE TRADES ACHIEVEMENT TEST

△ School 1964 □ Student

Instructional Materials Laboratory
Trade and Industrial Education Service
Division of Vocational Education
State Department of Education
Columbus, Ohio

PERCENTILE NORMS

School Median		ITEM	Student Score
24	SMM-A, F-1	Non-Lang.	21
23	SMM-A, F-1	Language	26
47	SMM-A, F-1	TOTAL	47
31		Stanford Arith. Form Jm	28
176		OMTAT Total	198
19		Applied Math.	21
4		Layout	4
10		Hand Tools	8
6		Measuring	2
2		Power Sawing	2
6		Drilling	5
8		Shaping	6
9		Heat Treating	4
18		Trade Science	15
38		Machining-Lathe	23
24		Milling	21
12		Blue Print Reading	9
5	Grinding	Bench	6
5	Grinding	Surface	4
7	Grinding	T & C	4
1	Grinding	Cyl.	2
2	Grinding	Internal	2

APPENDIX B

SCHOOLS PARTICIPATING

The next pages contain a partial listing of schools which have participated in the Ohio Trade and Industrial Education Testing Program. These schools are listed by states in the following order:

a. Ohio Schools

b. Illinois Schools

c. Indiana Schools

d. Kentucky Schools

e. West Virginia Schools

f. Delaware Schools

g. Utah

h. District of Columbia

i. National Printing Study

The schools contained in this listing participated in a National Study using the Printing Trades in 1966. For additional information concerning this study write to:

The Instructional Materials Laboratory
The Ohio State Universtiy
1885 Neil Avenue
Columbus, Ohio 43210

OHIO SCHOOLS

SCHOOL	CITY
Akron Hower Vocational High School	Akron
Alliance High School	Alliance
Ashland High School	Ashland
Ashtabula High School	Ashtabula
Barberton High School	Barberton
Bedford High School	Bedford
Bellefontaine High School	Bellefontaine
Bucyrus High School	Bucyrus
Cambridge High School	Cambridge
Canton Timken Vocational High School	Canton
Clay Senior High School	Oregon
Clearview High School	Lorain
Cleveland Max S. Hayes Trade School	Cleveland
Cloverleaf Senior High School	Lodi
Courter High School	Cincinnati
Cuyahoga Falls High School	Cuyahoga Falls
Dayton Patterson Cooperative High School	Dayton
Delaware Rutherford B. Hayes High School	Delaware
Dover High School	Dover
Elyria High School	Elyria
Findlay High School	Findlay
Fostoria High School	Fostoria
Fremont Ross High School	Fremont

OHIO SCHOOLS (Continued)

SCHOOL	CITY
Galion Senior High School	Galion
Glen Este High School	Amelia
Grove City Technical Training Center	Grove City
Hamilton Taft High School	Hamilton
Heath Area Vocational High School	Heath
Ironton High School	Ironton
Kenton Senior High School	Kenton
Lake County Joint Vocational School	Painesville
Lancaster High School	Lancaster
Lima Senior High School	Lima
Lorain Admiral King High School	Lorain
Lorain High School	Lorain
Mansfield Senior High School	Mansfield
Marietta High School	Marietta
Marion Harding High School	Marion
Martins Ferry High School	Martins Ferry
Massillon Washington High School	Massillon
Middletown High School	Middletown
Midpark High School	Berea
New Philadelphia Senior High School	New Philadelphia
Northmont High School	Clayton
Norwood High School	Norwood
Ottawa -Glandorf High School	Ottawa

OHIO SCHOOLS (Continued)

SCHOOL	CITY
Painesville High School	Painesville
Parma Senior High School	Parma
Parma Valley Forge High School	Parma Heights
Penta County Joint Vocational School	Perrysburg
Piketon Vocational School	Piketon
Piqua Central High School	Piqua
Portsmouth High School	Portsmouth
Riverview High School	Coshocton
St. Bernard High School	St. Bernard
Sandusky High School	Sandusky
Sidney High School	Sidney
Springfield North High School	Springfield
Sylvania High School	Sylvania
Toledo Macomber Vocational High School	Toledo
Trimble High School	Trimble
Tuscarawas Valley High School	Zoarville
Wadsworth Senior High School	Wadsworth
Warren G. Harding High School	Warren
Waterloo High School	New Marshfield
Whitmer High School	Washington Twp., Toledo
Willoughby North High School	Willoughby
York High School	Buchtel
Zanesville High School	Zanesville

ILLINOIS SCHOOLS

SCHOOL	CITY
Belvidere High School	Belvidere
Bloom Township High School	Chicago Heights
Canton Senior High School	Canton
Danville Senior High School	Danville
Dundee Community High School	Carpentersville
East Alton-Wood River Community High School	Wood River
East High School	Rockford
Frankfort Community High School	West Frankfort
Freeport Senior High School	Freeport
Galesburg Senior High School	Galesburg
Granite City Senior High School	Granite City
Herrin Township High School	Herrin Township
J. S. Morton High School	Cicero
Kankakee High School	Kankakee
LaSalle-Peru Township High School	LaSalle High
Macomb High School	Macomb
Marion Senior High School	Marion
Matton Senior High School	Matton
Moline Senior High School	Moline
Monmouth High School	Monmouth
Mt. Vernon Township High School	Mt. Vernon

ILLINOIS SCHOOLS (Continued)

SCHOOL	CITY
North Chicago Community High School	North Chicago
Petersburgh High School	Petersburgh
Proviso East High School	Maywood
Quincy Senior High School	Quincy
Rockford East Senior High School	Rockford
Springfield High School	Springfield
Sterling Township High School	Sterling
Stephen-Decatur High School	Decatur
Thornton Fractional Township High School	Calumet City
Thornton High School	Harvey
United Township High School	East Moline
Waukegan Township High School	Waukegan
Woodstock Community High School	Woodstock

INDIANA SCHOOLS

SCHOOL	CITY
Anderson High School	Anderson
Arsenal Technical High School	Indianapolis
Bartholomew High School	Columbus
Bedford High School	Bedford
Bloomington High School	Bloomington
Columbus High School	Columbus
Connersville Senior High School	Connersville
Decatur Central High School	Indianapolis
Edinburg Community High School	Edinburg
Elkhart High School	Elkhart
Evansville North High School	Evansville
Floyd County Schools	New Albany
Froebel High School	Gary
Gerstmeyer Technical High School	Terre Haute
Goshen High School	Goshen
Green Castel High School	Green Castle
Hammond Technical Vocational High School	Hammond
Haworth High School	Kokomo
Hobart Senior High School	Hobart
Honey Creek High School	Terre Haute
Lawrenceburg Consolidated High School	Lawrenceburg
Lincoln High School	Cambridge City

INDIANA SCHOOLS (Continued)

SCHOOL	CITY
Linton-Stockton High School	Linton
Logansport Community High School	Logansport
Madison Heights High School	Anderson
Marion High School	Marion
Martinsville High School	Martinsville
Merrillville High School	Crown Point
Muncie Trade School	Muncie
New Albany Senior High School	New Albany
North Lawrence High School	Bedford
Pekin High School	Pekin
Portage High School	Portage
Princeton High School	Princeton
Richmond Senior High School	Richmond
Roosevelt High School	East Chicago
Thomas B. White High School	Pendleton
Valparaiso High School	Valparaiso
Vernon Township High School	Crothersville
Washington High School	East Chicago
Wendell L. Wilke High School	Elwood

KENTUCKY SCHOOLS

SCHOOL	CITY
Ashland State Vocational School	Ashland
Harlan Area Vocational School	Harlan
Hazard State Vocational School	Hazard
Jefferson County Vocational School	Valley Station
Lafayette Area Vocational Technical School	Lexington
Madisonville State Vocational and Technical School	Madisonville
Mayo State Vocational and Technical School	Paintsville
Northern Kentucky State Vocational School	Covington
Owensboro Area Vocational School	Owensboro
Somerset Vocational School	Somerset
Tilghman Area Vocational School	Paducah
Western Area Vocational School	Bowling Green
West Kentucky State Vocational School	Paducah

WEST VIRGINIA SCHOOLS

SCHOOL	CITY
Cedar Grove High School	Cedar Grove
Charleston High School	Charleston
Clarksburg High School	Clarksburg
Collins High School	Oak Hill
Dupont High School	Belle
East Bank High School	East Bank
East Fairmont High School	Fairmont
Elkins High School	Elkins
Grafton High School	Grafton
Herbert Hoover High School	Clendenin
Huntington Vocational Technical School	Huntington
Kelly Miller Adult Education Center	Clarksburg
Logan High School	Logan
Man High School	Logan
Martinsburg Senior High School	Martinsburg
McDowell Vocational High School	Welch
McKinley Vocational High School	Wheeling
Mercer County Vocational High School	Bluefield
Morgantown High School	Morgantown
Moundsville High School	Moundsville
Nitro High School	Nitro
Parkersburg High School	Parkersburg

WEST VIRGINIA SCHOOLS (Continued)

SCHOOL	CITY
Pt. Pleasant High School	Pt. Pleasant
V. H. Prunty Trade School	Welch
Raleigh County Vocational Technical High School	Beckley
Richwood High School	Richwood
St. Mary's High School	St. Mary's
Shinnston Vocational High School	Clarksburg
South Charleston High School	South Charleston
Stonewall Jackson High School	Charleston
Taylor County Vocational School	Grafton
Union High School	Benwood
Washington Irving High School	Clarksburg
Weir High School	Weirton
Weston High School	Weston
Williamson Trade School	Williamson
Wyoming County Vocational Technical School	Pineville

DELAWARE SCHOOLS

SCHOOL	CITY
H. Fletcher Brown Technical High School	Wilmington
Dover High School	Dover
William W. M. Henry Comprehensive High School	Dover
Howard High School	Wilmington
William C. Jason Comprehensive High School	Georgetown
Sussex County Vocational-Technical Center	Georgetown

UTAH SCHOOLS

Cyprus High School	Magna
Davis High School	Kaysville
Delta High School	Delta
Richfield High School	Richfield
Salt Lake Trade Tech. Institute	Salt Lake City
Utah Trade Tech. Institute	Provo
Weber High School	Ogden
Weber State College	Ogden

DISTRICT OF COLUMBIA SCHOOLS

Bell High School	Washington
Chamberlain High School	Washington
Phelps High School	Washington

NATIONAL PRINTING STUDY

Schools Which Participated in National Printing Study - 1966

SCHOOL	CITY
ARIZONA	
Tucson High School	Tucson
ARKANSAS	
Metropolitan High School	Little Rock
CALIFORNIA	
Santa Cruz High School	Santa Cruz
COLORADO	
Colorado Springs, School #11	Colorado Springs
CONNECTICUT	
A. I. Prince Vocational-Technical School	Hartford
Bullard-Havens Technical School	Bridgeport
H. C. Wilcox Technical School	Meriden
J. M. Wright Technical School	Stamford
DISTRICT OF COLUMBIA	
Bell High School	Washington
Chamberlain High School	Washington
Phelps High School	Washington
FLORIDA	
Dixie Hollins High School	St. Petersburg
Lindsey Hopkins Education Center	Miami
Mid-Florida Technical School	Orlando
IDAHO	
Boise High School	Boise
ILLINOIS	
East Alton-Wood River High School	Wood River
J. S. Morton High School	Cicero
Proviso East High School	Maywood
INDIANA	
Bartholomew High School	Columbus
Bloomington High School	Bloomington
Elkhart High School	Elkhart
Gerstmeyer High School	Gerstmeyer
Hammond High School	Hammond
Marion High School	Marion
New Albany High School	New Albany

NATIONAL PRINTING STUDY (Cont.)

SCHOOL	CITY
IOWA	
Fort Dodge Senior High School	Fort Dodge
KANSAS	
Labette County Community High School	Alamont
Pittsburg High School	Pittsburg
S. E. Kansas Area Vocational Technical School	Columbus
KENTUCKY	
Northern Kentucky State Vocational School	Covington
Owensboro Area Vocational School	Owensboro
Somerset Area Vocational-Technical School	Somerset
MARYLAND	
Bladensburg Senior High School	Bladensburg
Fairmont Heights High School	Washington, D. C.
MASSACHUSETTS	
Attleboro Trade High School	Attleboro
Newton Technical High School	Newtonville
Pittsfield Vocational High School	Pittsfield
Springfield Trade High School	Springfield
Weldon Vocational High School	Medford
Weymouth Vocational Technical High School	Weymouth
MICHIGAN	
Bay City Central High School	Bay City
Hamtramck High School	Hamtramck
Lansing Eastern High School	Lansing
MINNESOTA	
Duluth Area Vocational-Technical School	Duluth
MISSOURI	
Kansas City Public Schools	Kansas City
O'Fallon Technical High School	St. Louis
NEBRASKA	
Lincoln High School	Lincoln
NEW JERSEY	
Essex County Vocational School	Newark

SCHOOL	CITY
NEW YORK	
McKee Vocational Technical High School	Staten Island
New York School of Printing	New York City
Sewanhaka High School	Floral Park, Long Island
Thomas A. Edison Vocational Technical High School	Jamaica
OHIO	
Akron Hower Vocational High School	Akron
Ashland High School	Ashland
Ashtabula High School	Ashtabula
Canton Timken Vocational High School	Canton
Courter High School	Cincinnati
Dayton Patterson Cooperative High School	Dayton
Lima Senior High School	Lima
Parma Senior High School	Parma
Parma Valley Forge	Parma Heights
Toledo Macomber Vocational High School	Toledo
Wadsworth Senior High School	Wadsworth
OKLAHOMA	
Midwest City High School	Midwest City
Muskogee Central High School	Muskogee
Oklahoma City Central High School	Oklahoma City
Oklahoma City Douglass High School	Oklahoma City
Will Rogers High School	Tulsa
PENNSYLVANIA	
Bucks County Technical School	Fairless Hills
Eastern Montgomery County Vocational Technical School	Willow Grove
Easton Area Vocational Technical School	Easton
Pittsburgh Connelley Vocational Technical High School	Pittsburgh
TENNESSEE	
Booker T. Washington High School	Memphis
TEXAS	
Brackenridge High School	San Antonio
Fort Worth Technical High School	Fort Worth
L. W. Fox Vocational Technical High School	San Antonio
Sidney Lanier High School	San Antonio
VERMONT	
Brattleboro Union High School.	Brattleboro
Burlington High School	Burlington

SCHOOL	CITY
WEST VIRGINIA	
Huntington East Vocational Technical School	Huntington
McKinley Vocational High School	Wheeling
WISCONSIN	
Memorial High School	Eau Claire